

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claims 1-15 (canceled).

Claim 16 (currently amended): A balanced-type surface acoustic wave filter connected to an unbalanced terminal and first and second balanced terminals and provided with a balance-unbalance conversion function, comprising:

a piezoelectric substrate;

a first surface acoustic wave filter section including first to third IDTs arranged along a surface acoustic wave propagating direction on the piezoelectric substrate, one of the second IDT disposed in a center and the first and third IDTs disposed on both sides of the second IDT being connected to the unbalanced terminal, and the other of the first and third IDTs and the second IDT being connected to the first balanced terminal; and

a second surface acoustic wave filter section including first to third IDTs arranged in the surface acoustic wave propagating direction on the piezoelectric substrate, one of the second IDT disposed in a center and the first and third IDTs disposed on both sides of the second IDT being connected to the unbalanced terminal, one of the first and third IDTs and the second IDT being connected to the second balanced terminal, and the second surface acoustic wave filter section having a phase of an output signal to an input signal different by about 180 degrees with respect to the first surface acoustic wave filter section; wherein

in the first and second surface acoustic wave filter sections, in a pair of IDTs adjacent to each other with a gap interposed therebetween in the surface acoustic wave propagating direction, a section where a cycle of a portion of electrode fingers including

an electrode finger facing the gap is less than a cycle of electrode fingers of a main portion of the IDT is set as a narrow pitch electrode finger section; and

when an electrode finger pitch of the narrow pitch electrode finger section of the IDT connected to the unbalanced terminal of the first and second surface acoustic wave filter sections is P1, an electrode finger pitch of the narrow pitch electrode finger section of the IDT connected to the balanced terminal is P2, the number of electrode fingers of the ~~pitch electrode finger section except for the narrow pitch electrode finger section~~ main portion of the IDT connected to the unbalanced terminal of the first and second surface acoustic wave filter sections is K1, and the number of electrode fingers of the ~~pitch electrode finger section except for the narrow pitch electrode finger section~~ main portion of the IDT connected to the balanced terminal is K2, the following relationships:

$$P1 > P2; \text{ and}$$

$$1.12 \leq K1/K2 \leq 1.65$$

are satisfied.

Claim 17 (previously presented): The balanced-type surface acoustic wave filters according to Claim 16, wherein when a metallization ratio in the first and second surface acoustic wave filter sections is d and an electrode finger cross width is W, $67.4 \lambda \leq W/d \leq 74.3 \lambda$ (where λ denotes a wavelength of the IDT) is satisfied.

Claim 18 (currently amended): A balanced-type surface acoustic wave filter connected to an unbalanced terminal and first and second balanced terminals and provided with a balance-unbalance conversion function, comprising:

a piezoelectric substrate;

a first surface acoustic wave filter section including first to third IDTs arranged along a surface acoustic wave propagating direction on the piezoelectric substrate, one of the second IDT disposed in a center and the first and third IDTs disposed on both

sides of the second IDT being connected to the unbalanced terminal, and the other of the first and third IDTs and the second IDT being connected to the first balance terminal; and

a second surface acoustic wave filter section including first to third IDTs arranged in the surface acoustic wave propagating direction on the piezoelectric substrate, one of the second IDT disposed in a center and the first and third IDTs disposed on both sides of the second IDT being connected to the unbalanced terminal, the other of the first and third IDTs and the second IDT being connected to the second balanced terminal, and the second surface acoustic wave filter section having a phase of an output signal to an input signal different by about 180 degrees with respect to the first surface acoustic wave filter section; wherein

in the first and second surface acoustic wave filter sections, in a pair of IDTs adjacent to each other with a gap interposed therebetween in the surface acoustic wave propagating direction, a section where a cycle of a portion of electrode fingers including an electrode finger facing the gap is less than a cycle of electrode fingers of a main portion of the IDT is set as a narrow pitch electrode finger section; and

when an electrode finger pitch of the narrow pitch electrode finger section of the IDT connected to the unbalanced terminal of the first and second surface acoustic wave filter sections is $P1$, an electrode finger pitch of the narrow pitch electrode finger section of the IDT connected to the balanced terminal is $P2$, the number of electrode fingers of the ~~pitch electrode finger section except for the narrow pitch electrode finger section~~ main portion of the IDT connected to the unbalanced terminal of the first and second surface acoustic wave filter sections is $K1$, the number of electrode fingers of the ~~pitch electrode finger section except for the narrow pitch electrode finger section~~ main portion of the IDT connected to the balanced terminal is $K2$, the number of electrode fingers of the narrow pitch electrode finger section of the IDT connected to the unbalanced terminal of the first and second surface acoustic wave filter sections is $K1n$, and the number of electrode fingers of the narrow pitch electrode finger section of the

IDT connected to the balanced terminal is $K2n$, the following relationships:

$$P1 > P2;$$

$$K1n = K2n; \text{ and}$$

$$1.12 \leq K1/K2 \leq 1.65$$

are satisfied.

Claim 19 (previously presented): The balanced-type surface acoustic wave filters according to Claim 18, wherein when a metallization ratio in the first and second surface acoustic wave filter sections is d and an electrode finger cross width is W , $67.4 \lambda \leq W/d \leq 74.3 \lambda$ (where λ denotes a wavelength of the IDT) is satisfied.

Claim 20 (currently amended): A balanced-type surface acoustic wave filter connected to an unbalanced terminal and first and second unbalanced terminals and provided with a balance-unbalance conversion function, comprising:

a piezoelectric substrate; and

first to third IDTs arranged in a surface acoustic wave propagating direction on the piezoelectric substrate; wherein

the second IDT is connected to the unbalanced terminal and the first and third IDTs disposed on both sides of the second IDT are respectively connected to the first and second balanced terminals;

in an area where the first to third IDTs are adjacent one another, the respective IDTs have narrow pitch electrode finger sections and an electrode finger pitch of the narrow pitch electrode finger section is less than an electrode finger pitch of a main portion of the pitch electrode finger section of the respective IDT ~~provided with narrow pitch electrode fingers~~;

a phase of the first IDT is reversed by about 180 degrees with respect to a phase of the third IDT; and

when an electrode finger pitch of the narrow pitch electrode finger section of the

second IDT located is set as P1, an electrode finger pitch of the narrow pitch electrode finger section of the first and third IDTs is P2, the number of electrode fingers of the ~~pitch electrode finger section except for the narrow pitch electrode finger section~~main portion of the second IDT is K1, and the number of electrode fingers of the ~~pitch electrode finger section except for the narrow pitch electrode finger section~~main portion of the first and third IDTs is K2, the following relationships:

$P1 > P2$; and

$1.12 \leq K1/K2 \leq 1.65$

are satisfied.

Claim 21 (previously presented): The balanced-type surface acoustic wave filters according to Claim 20, wherein when a metallization ratio in the first to third IDTs is d and an electrode finger cross width is W, $134.8 \lambda l \leq W/d \leq 148.6 \lambda l$ (where λl denotes a wavelength of the IDT) is satisfied.

Claim 22 (currently amended): A balanced-type surface acoustic wave filter connected to an unbalanced terminal and first and second ~~un~~balanced terminals and provided with a balance-unbalance conversion function, comprising:

a piezoelectric substrate; and

first to third IDTs arranged in a surface acoustic wave propagating direction on the piezoelectric substrate; wherein

the second IDT is connected to the unbalanced terminal and the first and third IDTs disposed on both sides of the second IDT are respectively connected to the first and second balanced terminals;

in an area where the first to third IDTs are adjacent one another, the respective IDTs have narrow pitch electrode finger sections and an electrode finger pitch of the narrow pitch electrode finger section is less than an electrode finger pitch of a main portion of the ~~pitch electrode finger section of the~~ respective IDT ~~provided with narrow~~

~~pitch electrode fingers;~~

a phase of the first IDT is reversed by about 180 degrees with respect to a phase of the third IDT; and

when an electrode finger pitch of the narrow pitch electrode finger section of the second IDT located in the center is P1, an electrode finger pitch of the narrow pitch electrode finger section of the first and third IDTs is P2, the number of electrode fingers of the ~~pitch electrode finger section except for the narrow pitch electrode finger section~~main portion of the second IDT is K1, the number of electrode fingers of the ~~pitch electrode finger section except for the narrow pitch electrode finger section~~main portion of the first and third IDTs is K2, the number of electrode fingers of the narrow pitch electrode finger section of the second IDT is K1n, the number of electrode fingers of the narrow pitch electrode finger section of the first and third IDTs is K2n, the following relationships:

$$P1 > P2;$$

$$K1n = K2n; \text{ and}$$

$$1.12 \leq K1/K2 \leq 1.65$$

are satisfied.

Claim 23 (previously presented): The balanced-type surface acoustic wave filters according to Claim 22, wherein when a metallization ratio in the first to third IDTs is d and an electrode finger cross width is W, $134.8 \lambda I \leq W/d \leq 148.6 \lambda I$ (where λI denotes a wavelength of the IDT) is satisfied.

Claim 24 (currently amended): A balanced-type surface acoustic wave filter connected to an unbalanced terminal and first and second balanced terminals and provided with a balance-unbalance conversion function, comprising:

a piezoelectric substrate; and

first to third IDTs arranged in a surface acoustic wave propagating direction on

the piezoelectric substrate; wherein

the first and third IDTs disposed on both sides in a surface acoustic wave propagating direction are connected to the unbalanced terminal;

the second IDT includes first and second IDT sections divided in the surface acoustic wave propagating direction, the first and second IDT sections are respectively electrically connected to the first and second balanced signal terminals, and the first to third IDTs are arranged such that a phase of a signal emanating from the unbalanced terminal to the first balanced signal terminal is reversed by about 180 degrees with respect to a phase of a signal emanating from the unbalanced terminal to the second balanced signal terminal;

in an area where the first to third IDTs are adjacent one another in the surface acoustic wave propagating direction with a gap interposed therebetween, a plurality of electrode fingers near the gap correspond to a narrow pitch electrode finger section where a pitch of the electrode fingers is relatively small; and

when an electrode finger pitch of the narrow pitch electrode finger section of the first and third IDTs connected to the unbalanced signal terminal is P1, an electrode finger pitch of the narrow pitch electrode finger section of the second IDT whose first and second IDT sections are respectively connected to the first and second balanced signal terminal is P2, the number of electrode fingers of ~~the pitch an~~ electrode finger section ~~except for~~ excluding the narrow pitch electrode finger section of the first and third IDTs is K1, and the number of electrode fingers of ~~the pitch an~~ electrode finger section ~~except for~~ excluding the narrow pitch electrode finger section of the second IDT is K2, the following relationships:

$P1 > P2$; and

$1.12 \leq K1/K2 \leq 1.65$

are satisfied.

Claim 25 (previously presented): The balanced-type surface acoustic wave filters

according to Claim 24, wherein when a metallization in the first to third IDTs is d and an electrode finger cross width is W , $134.8 \lambda \leq W/d \leq 148.6 \lambda$ (where λ denotes a wavelength of the IDT) is satisfied.

Claim 26 (currently amended): A balanced-type surface acoustic wave filter connected to an unbalanced terminal and first and second balanced terminals and provided with a balance-unbalance conversion function, comprising:

a piezoelectric substrate; and

first to third IDTs arranged in a surface acoustic wave propagating direction on the piezoelectric substrate; wherein

the first and third IDTs disposed on both the sides in a surface acoustic wave propagating direction are connected to the unbalanced terminal;

the second IDT includes first and second IDT sections divided in the surface acoustic wave propagating direction, the first and second IDT sections are respectively electrically connected to the first and second balanced signal terminals, and the first to third IDTs are arranged such that a phase of a signal emanating from the unbalanced terminal to the first balanced signal terminal reversed by about 180 degrees with respect to a phase of a signal emanating from the unbalanced terminal to the second balanced signal terminal; and

in an area where the first to third IDTs are adjacent one another in the surface acoustic wave propagating direction with a gap interposed therebetween, a plurality of electrode fingers near the gap correspond to a narrow pitch electrode finger section where a pitch of the electrode fingers is relatively small, and when an electrode finger pitch of the narrow pitch electrode finger section of the first and third IDTs connected to the unbalanced signal terminal is $P1$, an electrode finger pitch of the narrow pitch electrode finger section of the second IDT whose first and second IDT sections are respectively connected to the first and second balanced signal terminal is $P2$, the number of electrode fingers of the pitch $P1$ is n and the number of electrode fingers of the pitch $P2$ is m , n and m are integers, and n is not equal to m .

the narrow pitch electrode finger section of the first and third IDTs is K_1 , the number of electrode fingers of the ~~the pitch an~~ electrode finger section except for excluding the narrow pitch electrode finger section of the second IDT is K_2 , the number of electrode fingers of the narrow pitch electrode finger section of the first and third IDTs is K_{1n} , and the number of electrode fingers of the narrow pitch electrode finger section of the second IDT is K_{2n} , the following relationships:

$$P_1 > P_2;$$

$$K_{1n} = K_{2n}; \text{ and}$$

$$1.12 \leq K_1/K_2 \leq 1.65$$

are satisfied.

Claim 27 (previously presented): The balanced-type surface acoustic wave filters according to Claim 26, wherein when a metallization in the first to third IDTs is d and an electrode finger cross width is W , $134.8 \lambda l \leq W/d \leq 148.6 \lambda l$ (where λl denotes a wavelength of the IDT) is satisfied.

Claim 28 (previously presented): A balanced-type surface acoustic wave filter connected to an unbalanced terminal and first and second balanced terminals and provided with a balance-unbalance conversion function, comprising:

a piezoelectric substrate;

a first surface acoustic wave filter section including first to third IDTs arranged along a surface acoustic wave propagating direction on the piezoelectric substrate, one of the second IDT disposed in a center or the first and third IDTs disposed on both sides of the second IDT being connected to the unbalanced terminal, and the other of the first and third IDTs and the second IDT being connected to the first balanced terminal; and

a second surface acoustic wave filter section including first to third IDTs arranged in the surface acoustic wave propagating direction on the piezoelectric substrate, one of the second IDT disposed in a center or the first and third IDTs disposed on both sides of

the second IDT being connected to the unbalanced terminal, the other of the first and third IDTs and the second IDT being connected to the second balanced terminal, and the second surface acoustic wave filter section having a phase of an output signal to an input signal different by about 180 degrees with respect to the first surface acoustic wave filter section; wherein

in the first and second surface acoustic wave filter sections, in a pair of IDTs adjacent to each other with a gap interposed therebetween in the surface acoustic wave propagating direction, a section where a cycle of a portion of electrode fingers including an electrode finger facing the gap is less than a cycle of electrode fingers of a main portion of the IDT is set as a narrow pitch electrode finger section; and

when an electrode finger pitch of the narrow pitch electrode finger section of the IDT connected to the unbalanced terminal of the first and second surface acoustic wave filter sections is $P1$, the number of electrode fingers of the narrow pitch electrode finger section thereof is $N1$, an electrode finger pitch of the narrow pitch electrode finger section of the IDT connected to the first and second balanced terminals is $P2$, and the number of electrode fingers of the narrow pitch electrode finger section thereof is $N2$, the following relationships:

$P1 \neq P2$; and

$N1 < N2$

are satisfied.

Claim 29 (previously presented): The balanced-type surface acoustic wave filter according to Claim 28, wherein $P1 < P2$ is satisfied.

Claim 30 (currently amended): A balanced-type surface acoustic wave filter connected to an unbalanced terminal and first and second ~~un~~balanced terminals and provided with a balance-unbalance conversion function, comprising:

a piezoelectric substrate; and

first to third IDTs arranged in a surface acoustic wave propagating direction on the piezoelectric substrate; wherein

the second IDT is connected to the unbalanced terminal and the first and third IDTs are respectively connected to the first and second balanced terminals;

in an area where the first to third IDTs are adjacent one another, the respective IDTs have narrow pitch electrode finger sections and an electrode finger pitch of the narrow pitch electrode finger section is less than an electrode finger pitch of a main portion of the pitch electrode finger section of the respective IDT provided with narrow pitch electrode fingers;

a phase of the first IDT is reversed by about 180 degrees with respect to a phase of the third IDT; and

when an electrode finger pitch of the narrow pitch electrode finger section of the second IDT connected to the unbalanced terminal is $P1$, the number of electrode fingers of the narrow pitch electrode finger section thereof is $N1$, an electrode finger pitch of the narrow pitch electrode finger section of the first and third IDTs connected to the first and second balanced terminals is $P2$, and the number of electrode fingers of the narrow pitch electrode finger section thereof is $N2$, the following relationships:

$$P1 \neq P2; \text{ and}$$

$$N1 < N2$$

are satisfied.

Claim 31 (previously presented): The balanced-type surface acoustic wave filter according to Claim 30, wherein $P1 < P2$ is satisfied.

Claim 32 (previously presented): A balanced-type surface acoustic wave filter connected to an unbalanced terminal and first and second balanced terminals and provided with a balance-unbalance conversion function, comprising:

a piezoelectric substrate; and

first to third IDTs arranged in a surface acoustic wave propagating direction on the piezoelectric substrate; wherein

the first and third IDTs located on both sides in a surface acoustic wave propagating direction are connected to the unbalanced terminal;

the second IDT includes first and second IDT sections divided in the surface acoustic wave propagating direction, the first and second IDT sections are respectively electrically connected to the first and second balanced signal terminals, and the first to third IDTs are arranged such that a phase of a signal emanating from the unbalanced terminal to the first balanced signal terminal reversed by about 180 degrees with respect to a phase of a signal emanating from the unbalanced terminal to the second balanced signal terminal;

in an area where the first to third IDTs are adjacent one another in the surface acoustic wave propagating direction with a gap interposed therebetween, the respective IDTs have narrow pitch electrode finger sections at areas near the gap; and

when an electrode finger pitch of the narrow pitch electrode finger section of the first and third IDTs connected to the unbalanced signal terminal is $P1$, the number of electrode fingers of the narrow pitch electrode finger section thereof is $N1$, an electrode finger pitch of the narrow pitch electrode finger section of the second IDT whose first and second IDT sections are respectively connected to the first and second balanced signal terminal is $P2$, and the number of electrode fingers of the narrow pitch electrode finger section thereof is $N2$, the following relationships:

$P1 \neq P2$; and

$N1 < N2$

are satisfied.

Claim 33 (previously presented): The balanced-type surface acoustic wave filter according to Claim 32, wherein $P1 < P2$ is satisfied.